Listing of Claims

If entered, this listing of claims will replace all previous listings and versions of the claims.

1. (Currently Amended) A method of preparing a carbon doped silicon oxide (CDO) film on a substrate, the method comprising:

(a) providing the substrate to a deposition chamber; and

(b) contacting the substrate with one or more CDO precursors, at least one of which contains a carbon-carbon triple bond, under process conditions whereby the CDO film is formed on the substrate, and whereby the CDO film contains carbon-carbon triple bonds and the CDO film has a dielectric constant of less than 2.7,

wherein the CDO precursor comprises one or more compounds selected from the list consisting of Ethynyltrimethylsilane (ETMS), Propargyltrimethylsilane (PTMS), Propargyloxytrimethylsilane (POTMS), Bis(trimethylsilyl)acetylene (BTMSA), 1,3-Diethynyltetramethyldisiloxane (DTDS), Dimethylmethoxysilaneacetylene (DMMOSA), Methyldimethoxysilaneacetylene (MDMOSA), Dimethylethoxysilaneacetylene (DMEOSA), Methyldiethoxysilaneacetylene (MDEOSA), Ethyldiethoxysilaneacetylene (EDEOSA), and Dimethylsilane-diacetylene (DMSDA).

2. (Original) The method of claim 1, wherein the CDO film has a dielectric constant of not greater than about 2.6.

3. (Original) The method of claim 1, wherein the substrate is a partially fabricated integrated circuit.

4. (Original) The method of claim 3, wherein the CDO film is an interlayer dielectric in an integrated circuit.

5. (Original) The method of claim 1, wherein the deposition chamber comprises one or multiple stations that allow processing one or multiple substrates in parallel.

6. (Original) The method of claim 1, wherein the CDO film is formed on the substrate by a chemical vapor deposition process.

7. (Original) The method of claim 1, wherein the CDO film is formed on the substrate by a plasma enhanced chemical vapor deposition (PECVD) process.

8. (Original) The method of claim 1, wherein contacting the substrate comprises contacting with only a single CDO precursor in a carrier gas.

9. (Canceled)

10. (Canceled)

11. (Original) The method of claim 8, wherein the single CDO precursor is selected from the group consisting of silanes having at least one hydrocarbon group with a triple bond and at least one alkyl group and bis(alkylsilyl)acetylenes.

12. (Canceled)

13. (Original) The method of claim 1, wherein contacting the substrate with one or more CDO precursors comprises contacting the substrate with both a primary CDO precursor and a secondary CDO precursor in a carrier gas.

14. (Original) The method of claim 13, wherein contacting the substrate with one or more CDO precursors comprises contacting the substrate with a secondary precursor selected from the group consisting of 1,3-Divinyltetramethyldisiloxane (DVDS), Vinyltrimethylsilane (VTMS), Vinylmethyldimethoxysilane (VMDMOS), and Divinyldimethylsilane (DVDMS).

15. (Original) The method of claim 13, wherein the primary CDO precursor is an alkylsiloxane and the secondary CDO precursor comprises the carbon-carbon triple bond.

16. (Original) The method of claim 15, wherein the secondary CDO precursor is a hydrocarbon that also serves as a carrier gas.

17. (Original) The method of claim 13, wherein the primary CDO precursor comprises an alkylcyclotetrasiloxane.

18. (Original) The method of claim 1, wherein the one or more CDO precursors are provided in a carrier gas.

19. (Original) The method of claim 18, wherein the carrier gas comprises one or more gases selected from the group consisting of carbon dioxide, oxygen, ozone, nitrous oxide and hydrogen peroxide.

20. (Original) The method of claim 18, wherein the carrier gas comprises one or more gases selected from the group consisting of helium, argon, and other inert gases.

21. (Original) The method of claim 1, wherein the as deposited CDO film has a carbon-carbon triple bond to silicon-oxygen bond ratio of about 0.05% to 20% based on FTIR peak areas.

22. (Original) The method of claim 21, where the as deposited CDO film also contains derivative bond structures of carbon-carbon triple bonds, wherein the derivative bond structures include one or more of the following: carbon-carbon double bonds, carbon-carbon single bonds, and their crosslinked forms within the Si-O-Si matrix.

23. (Currently Amended) A method of preparing a carbon doped silicon oxide (CDO) film on a substrate, the method comprising:

(a) providing the substrate to a plasma enhanced chemical vapor deposition (PECVD) reaction chamber;

(b) forming a plasma in the reaction chamber; and

(c) introducing an oxygen-containing carrier gas and one or more CDO precursors, at least one of which has a carbon-carbon triple bond, to the reaction chamber under process conditions whereby the CDO film is formed on the substrate,

whereby the CDO film contains carbon-carbon triple bonds, in sufficient amounts that the CDO film has a dielectric constant of less than than about 2.6 and the CDO film has a carbon-carbon triple bond to silicon oxide bond ratio of about 0.3% to 7% based on FTIR peak area.

24. (Original) The method of claim 23, wherein the carrier gas comprises one or more gases selected from the group consisting of carbon dioxide, oxygen, ozone, nitrous oxide and hydrogen peroxide.

25. (Original) The method of claim 23, wherein the carrier gas comprises one or more gases selected from the group consisting of helium, argon and other inert gases.

26. (Original) The method of claim 23, wherein the one or more CDO precursors comprises one or more compounds selected from the list consisting of Ethynyltrimethylsilane (ETMS), Propargyltrimethylsilane (PTMS), Propargyloxytrimethylsilane (POTMS), Bis(trimethylsilyl)acetylene (BTMSA), 1,3-Diethynyltetramethyldisiloxane (DTDS), Dimethylmethoxysilaneacetylene (DMMOSA), Methyldimethoxysilaneacetylene (MDMOSA), Dimethylethoxysilaneacetylene (DMEOSA), Methyldiethoxysilaneacetylene (MDEOSA), Ethyldiethoxysilaneacetylene (EDEOSA), and Dimethylsilane-diacetylene (DMSDA).

27. (Original) The method of claim 23, wherein the one or more CDO precursors comprises a primary precursor and a secondary precursor, and wherein the secondary precursor is selected from the group consisting of 1,3-Divinyltetramethyldisiloxane (DVDS), Vinyltrimethylsilane (VTMS), Vinylmethyldimethoxysilane (VMDMOS), and Divinyldimethylsilane (DVDMS).

28-35. (Canceled)